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when embarking; *q q* guy ropes to steady the gun when under the boat's bottom.

Figures 5 *and* 6.

Plan and profile section.—*l l* windlass; *m* iron stanchion; *n n* iron stays attached to the stanchion, to keep it steady in a fore and aft direction; *k* water-tight trunk.

JOHN COW.

No. XIII.

FORCING PUMP.

The sum of FIVE GUINEAS *was this session presented to Mr.* ELISHA PECHEY, *of Bury St. Edmunds, for his Forcing Pump; a model of which has been placed in the Society's repository.*

THE circumstances to be remarked of Mr. Pechey's pump, are, first, the construction of the pump itself; and, secondly, the mode of uniting the pieces of leaden pipe composing the tube through which the water passes.

Whatever be the depth of the well, a frame of timber is to be laid across it at a height not exceeding ten or fifteen feet above the average surface of the water. A semicircular pump-barrel, similar to that invented by Mr. Aust, and described in vol. 37 of the Society's Transactions, is fixed on this frame, and is connected with the ascending pipe, which is furnished with two valves, opening upwards, one being placed below and the other above the junction of the pipe with the barrel, thus forming a forcing pump. The piston moves on an axis, placed in the centre of a circle of which the barrel is a part of the circumference, and is worked by means of two opposite horizontal levers, fixed on the axis of the piston.

The pump-handle in its frame is placed at the top of the well, having two eyes, one on each side of the centre on which it moves; two series of iron-rods fasten into these two eyes at their upper extremity, and at their lower into the two horizontal levers above mentioned. The rods in the two series are merely simple bars, hooked at each end, except that the upper one in each series is a screw-bolt, taking into a link, in order to afford an easy method of correcting any casual elongation of the rods. By this arrangement the two series of rods balance each other.

With regard to the junction of the several pieces forming the leaden-pipe through which the water is forced, Mr. Pechey observes that the usual mode of joining them, namely, by solder, cannot be effected without the expense of laying a stage across the well, in order to support the workmen, as well as the pot for melting the solder, &c.; and as this requires to be repeated for each juncture, the time thus consumed adds considerably to the total expense. Mr. Pechey unites the ends of the pipes by means of two square pieces of cast-iron, having a leather washer between, the whole being perfectly secured by four screws; and a single workman, suspended in a light frame, like a scale-board, is capable of applying this apparatus.

Certificates from the magistrates and other persons in the town of Bury, attest that a pump on the above construction has been put up in that town, which raises water from a depth of 90 feet, and has given, and continues to give, entire satisfaction.

Reference to the Engraving of Mr. Elisha Pechey's Pump.

Plate X. Fig. 1, *a a* a plank fixed close on the side of the well top, as shown in fig. 2. On this is raised the pump-post *b b*; *c c* the handle; *d d d d* iron-rods; *e e* swivel screws to tighten them; *f f* holes in the plank *a*, through which the rods pass: *g g* slings at the bottom of the rods, to lay hold of the piston levers *t t*, one is shown separate at fig. 3; *h h* the semi-circular pump-barrel from the centre *i* of which the piston *j j* works (fig. 4 shows the piston separate); *k* the valve box; *l* the descending pipe; *m m* the ascending pipe. The barrel is made in two halves, *n n n n* are the fins or flanches by which they are screwed together; *o o* an iron brace curved to fit the barrel: there is one on each side, and they are bolted together by the screw-bolts *p p*, which pass through them and the flanch *n*; *q* is a third brace; all these are screwed at *s s s*, and thus securely fix the barrel to the plank or staging *r r*, which is placed near the bottom of the well, under the plank *a a* (as fig. 5); *v v* the joints of the pipes; *u u* one of their supports against the sides of the well. Fig. 6 shows the joint separated and in section; the lead is beat out to form the flanches *w w*; *x x* are two cast-iron plates, with recesses to receive the flanches; *y* is a leather collar, with a bit of thin copper pipe passing through it to secure the thoroughfare when screwed together by the screws *z z*. Fig. 7, a bird's-eye view of the pump-barrel; *t t t t* the four arms or levers of the piston *j*, which the slings *g g* (figs. 1 and 3) lay hold of. Figs. 8 and 9 show one-half of the barrel separate; and fig. 10 shows a section of that half. They are made by turning a wooden pattern, so as to form a complete circle, like fig. 13, the section from the

circumference to the centre of which is shown in fig. 10. This is cut in halves, leaving the boss *i* on one, and putting another boss like it to the other half; a piece of flanch *n*, and half a valve box *k*, figs. 8 and 9, are to be added; they are then to be cast in metal, and the castings cleaned out by circular hardened steel scrapers (the one used for finishing being rather larger than the other); the scraper is fixed in a clamp *a a*, figs. 9 and 10, secured to the same centre *i* from which the piston is to work.

The Society, in the year 1819, rewarded Mr. William Aust, of Hoxton, for his invention of a circular pump, and published a description thereof, with the method of making it, in their 37th vol. He casts the whole circle, and then turns the hollow by a tool (there described), so as to secure a clean and true semi-circle; the flanches are also turned flat, so that when cut in halves, the parts meet very truly together. Now, to adopt that method to Mr. Pechey's pump, it will require some such alteration as is shown in fig. 11, where the valve-box *k* is made separate, and screwed between the flanches *c c* and *d d*; *e e* being two of the screws which bind the whole together.

Fig. 12 shows the part forming the valve-box separate; one side is flat to receive the ascending pipe *l*, and suit the inner valve; the flanches *c* and *d*, fig. 11, may be screwed close together, without the box, and the pipe *b* and its valve be fixed to the barrel where the dotted circle *f* is placed.

Fig. 13 shows the form of the pattern, or the work before it is cut in two; *c c c c* the two half flanches shown by dotted lines.